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Medium- and large-sized mammals in Mata Atlântica State Park, southeastern Goiás, Brazil

Ednaldo Cândido Rocha*, **Kálita Luis Soares** and **Ismael Martins Pereira**

Universidade Estadual de Goiás, Câmpus de Ipameri, Rodovia GO 330, km 241, Anel Viário, CEP 75780-000, Ipameri, GO, Brazil
* Corresponding author. E-mail: ednaldorocha@yahoo.com.br

Abstract: The purpose of this study was to carry out an inventory of medium and large-sized mammal species occurring in the Mata Atlântica State Park (MASP). Located in Água Limpa municipality, state of Goiás, the MASP occupies an important area with a seasonal forest remnant, which is considered an enclave of the Atlantic Forest within the Cerrado biome. From October 2012 to December 2013, MASP's area was randomly surveyed for evidence of mammal presence. Records of 23 species of wild mammals were obtained, seven of them listed as nationally endangered. Medium and large-sized mammal species composition is characteristic of the Cerrado biome, and no endemic species of the Atlantic Forest were recorded. Richness and diversity of the mammal species recorded in MASP show the importance of this protected area for *in situ* conservation.

Key words: Cerrado, Atlantic Forest, fauna survey, protected area

INTRODUCTION

The Cerrado is the second largest Brazilian biome, covering originally about 2 million km², approximately 23% of the country, with different vegetation types that include arboreal forests and grass savannas (Ribeiro and Walter 1998). In recent years, the Cerrado has undergone rapid reduction of its original vegetation due to the expansion of agricultural areas in central Brazil. Estimates indicate that about half of the original biome extent has been transformed into planted pastures, annual crops and other types of land use (Ratter et al. 1997; Klink and Machado 2005).

The original Atlantic Forest area covered about 1.5 million km², mostly along the Brazilian coast; 92% of the forest lies in Brazilian territory and the remaining areas are in Argentina and Paraguay (Ribeiro et al. 2009). Presently, only 11.7% remains with its original biotic features (Ribeiro et al. 2009). There are some inland fragments of Atlantic Forest and other enclaves scattered throughout the Cerrado, Pantanal, Caatinga and Pampa regions (Stehmann et al. 2009), comprising 17 Brazilian states. Thus, estimates made by Felfili (2003) point out to a total extent of 300,000 km² (15%) of seasonal forests enclaves, part of the Atlantic Forest, in the Cerrado biome.

The Cerrado and the Atlantic Forest biomes were included among the world's 34 hotspots because of their high level of endemism and for being threatened ecosystems (Myers et al. 2000; Mittermeier et al. 2005). The drastic habitat reduction and genetic isolation of populations are serious consequences of the deforestation and fragmentation that the Atlantic Forest and the Cerrado have suffered. The threat to native fauna may also occur in subtle ways, such as reduced dispersal and colonization rates, since many mammal, bird and insect species do not cross even narrow strips of open land because of predation dangers (Garay and Dias 2001).

The Mata Atlântica State Park (MASP), located in the Água Limpa municipality, southeastern portion of the state of Goiás, has important seasonal forest remnants, which are considered dispersed Atlantic Forest areas (SEMARH 2014). However, studies on these protected areas are still in their early stages, and there is a need for cataloguing and monitoring their natural resources. The threat degree and ecological relevance of the mammals emphasize the need to include information about medium and large-sized species in inventories and environmental diagnoses (Pardini et al. 2003), essential activities for understanding and establishing biodiversity protection strategies (Garay and Dias 2001). In this context, the objective of this study was to identify and record the medium and large-sized mammal species in the MASP.

MATERIALS AND METHODS

Study area

The study was conducted in the Mata Atlântica State Park (MASP) (18°12′43″ S, 048°46′17″ W), located in the Água Limpa municipality, in the southeastern part of

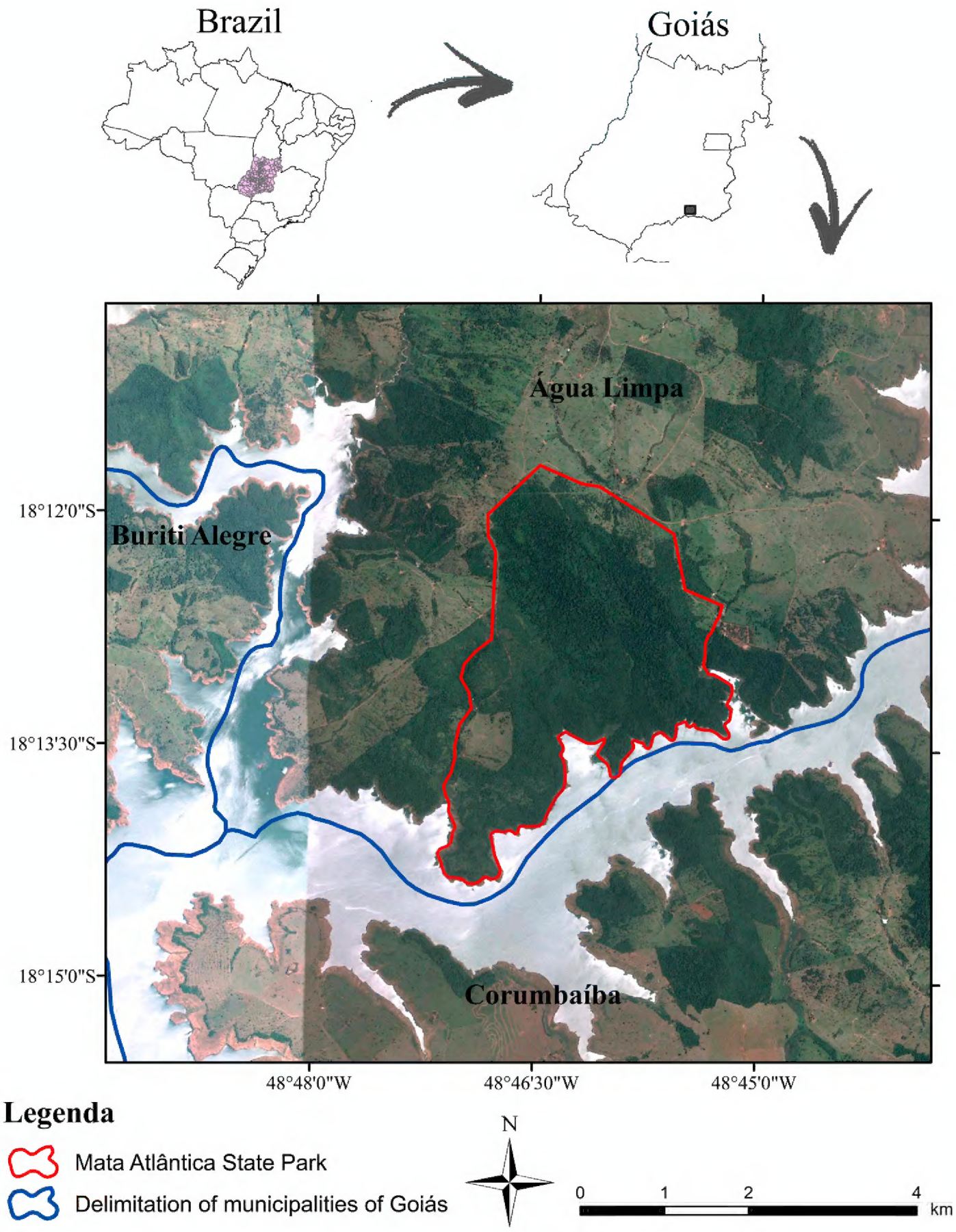

Figure 1. Location of the Mata Atlântica State Park, southeast of the state of Goiás, Brazil.

the state of Goiás (Figure 1). It is a protected area of 938 ha, established by State Decree no. 6442 on 12 April 2006 (SEMARH 2014).

The climate in the region is classified as Aw (tropical seasonal), with annual rainfall of about 1,600 mm, two distinct seasons, dry winter and rainy summer, with average temperature of 23°C (Alvares et al. 2014). The park lies on a plateau at an elevation from 520 to 691 m and features low hills and mounds, where eutrophic red argisol prevails (EMBRAPA 2006).

The MASP includes areas that were deforested for the establishment of pastures, now being restored after changes in land use, and more preserved areas which have not been clear-cut, i.e., where no change in land use has occurred. However, this environment has a history of wood extraction and fires in some places, and the most recent fire occurred in 2010.

In the most preserved part of MASP, seasonal semideciduous and deciduous forests, both with woody vegetation that loses its leaves during the dry season, are predominant. These forests are composed of species that are present in the Atlantic Forest biome (Interior Atlantic Forest), typical in central Brazil and conditioned to double climate seasonality (Filho 2012). The forests along watercourses are called gallery forests, or riparian forests, and the others are called seasonal forests, because they are dynamically linked to climate seasonality (Oliveira-Filho and Ratter 2002).

The MASP presents typical Atlantic Forest species, such as the Peroba-rosa TimberT (*Aspidosperma polyneuron* Muell. Arg), Jatobá (*Hymenaea courbaril* L.) and White Jequitibá (*Cariniana estrellensis* [Raddi] Kuntze), which stand out among the other species due to their size and dominance. In the MASP, peroba specimens

up to 40 m tall and 142 cm in diameter at breast height (DBH) and 25m tall jatobás with 133 cm DBH, were recorded.

Data collection and analysis

Data collection was conducted in October 2012 and in January, February, May, July and December 2013, totaling 12 days of field sampling.

Mammals were sampled using direct (sound recording and sighting) and indirect (tracks, burrows and other signs) methods. The surveys (active search) were conducted during the day and at night along roads and trails existing in the area. The active searches consisted of walking, individually or in pairs, at an average speed of 1.20 km/h (Rocha et al. 2008). Day surveys covered 12.43 km, night surveys 2.97 km, for a total of 15.4 km. Additionally, mammals were recorded through direct and indirect methods, mainly tracking on roads, trails and surrounding areas, as well as trace searching along stream banks.

In this study, mammals were considered medium and large-sized if their body mass exceeded 1 kg as adults, according to the criteria adopted by Chiarello (2000) and Rocha and Silva (2009). The taxonomic arrangement followed Paglia et al. (2012) and Nascimento and Garbino (2013) for subspecies of *Puma concolor* (*P. c. concolor*).

The records of each medium and large-sized mammal species obtained in the study area enabled the estimation of the species richness, by Jackknife 1 estimator (Heltshe and Forrester 1983, Santos 2003), using the EstimateS software version 9.1 (Colwell 2013). These data were also used for the construction of the species rarefaction curve (collector curve). In addition, we calculated the similarity of species of medium and large-sized mammals between MASP and the Cerrado and Atlantic Forest biomes, using the Jaccard Similarity Index (Cj). Information about body mass and geographic distribution of the species were obtained from Paglia et al. (2012).

RESULTS

Records of 23 medium and large-sized mammal species were obtained. These belonged to nine orders: Didelphimorphia (one species), Pilosa (two species), Cingulata (four species), Perissodactyla (one species), Artiodactyla (two species), Primates (one species), Carnivora (eight species), Lagormorpha (one species) and Rodentia (three species). The list presented in this study was composed of species identified by their tracks, sightings, burrows and feces (Table 1, Figure 2).

The MASP exhibited a greater similarity of species with the Cerrado biome (Cj = 0.53) than with the Atlantic Forest (Cj = 0.31). The richness of medium and large-sized

Table 1. Medium and large-sized mammals registered in Mata Atlântica State Park, Água Limpa municipality, state of Goiás, Brazil.

Taxon	Common name	Type of record
Didelphimorphia		
Didelphidae		
Didelphis albiventris Lund 1840	White-eared Opossum	Tracks
Pilosa		
Myrmecophagidae		
Myrmecophaga tridactyla Linnaeus, 1758*	Giant Anteater	Tracks
Tamandua tetradactyla (Linnaeus, 1758)	Collared Anteater	Tracks
Cingulata		
Dasypodidae		
Cabassous cf. *unicinctus* (Linnaeus, 1758)	Naked-tailed Armadillo	Tracks and burrows
Euphractus sexcinctus (Linnaeus, 1758)	Yellow Armadillo	Tracks and burrows
Dasypus novemcinctus Linnaeus, 1758	Nine-banded Armadillo	Tracks and burrows
Priodontes maximus (Kerr, 1792)*	Giant Armadillo	Tracks and burrows
Perissodactyla		
Tapiridae		
Tapirus terrestris (Linnaeus, 1758)*	Tapir	Tracks
Artiodactyla		
Cervidae		
Mazama gouazoubira (G. Fischer, 1814)	Gray Bbrocket Deer	Sightings and tracks
Tayassuidae		
Pecari tajacu (Linnaeus, 1758)	Collared Peccary	Sightings, tracks and feces
Primates		
Cebidae		
Sapajus libidinosus (Spix, 1823)	Capuchin Monkey	Sightings and vocalization
Carnivora		
Canidae		
Cerdocyon thous (Linnaeus, 1766)	Crab-eating Fox	Tracks
Chrysocyon brachyurus (Illiger, 1815)*	Maned Wolf	Tracks and feces
Felidae		
Puma concolor concolor (Linnaeus, 1771)*	Puma	Tracks
Puma yagouaroundi (É. Geoffroy, 1803)*	Jaguarundi	Tracks
Leopardus pardalis (Linnaeus, 1758)*	Ocelot	Tracks
Mustelidae		
Eira barbara (Linnaeus, 1758)	Tayra	Tracks
Procyonidae		
Nasua nasua (Linnaeus, 1766)	South American Coati	Tracks
Procyon cancrivorus (G. Cuvier, 1798)	Crab-eating Raccoon	Tracks
Lagomorpha		
Leporidae		
Sylvilagus brasiliensis (Linnaeus, 1758)	Tapeti	Sightings and tracks
Rodentia		
Caviidae		
Hydrochoerus hydrochaeris (Linnaeus, 1766)	Capybara	Tracks
Cuniculidae		
Cuniculus paca (Linnaeus, 1766)	Spotted Paca	Tracks
Dasyproctidae		
Dasyprocta azarae (Lichtenstein, 1823)	Azara's Agouti	Sightings and tracks

* Endangered species in Brazil (MMA 2014).

Figure 2. Evidence of medium and large-sized mammals recorded in Mata Atlântica State Park, Água Limpa municipality, state of Goiás, Brazil. Legend: **A** = *Didelphis albiventris*, **B** = *Myrmecophaga tridactyla*, **C** = *Cabassous* cf. *unicinctus* (burrow), b = *Euphractus sexcinctus* (burrow), **E** = *Dasypus novemcinctus*, **F** = *Priodontes maximus*, **G** = *Tapirus terrestris*, **H** = *Mazama gouazoubira*, **I** = *Pecari tajacu*, **J** = *Sapajus libidinosus*, **K** = *Cerdocyon thous*, **L** = *Chrysocyon brachyurus*, **M** = *Puma concolor concolor*, N = *Leopardus pardalis*, **O** = *Nasua nasua*, P = *Procyon cancrivorus*, **Q** = *Sylvilagus brasiliensis*, **R** = *Hydrochoerus hydrochaeris*, **S** = *Cuniculus paca*, **T** = *Dasyprocta azarae.*

mammals in the MASP was estimated through Jackknife 1 at 27 species (confidence interval = 3.43), slightly higher than the observed number (23 species). Thus, the rarefaction curve (Figure 3) did not present a complete asymptote, indicating an upward trend. Therefore, an increase in the sampling effort is expected to reveal some species not registered in this study.

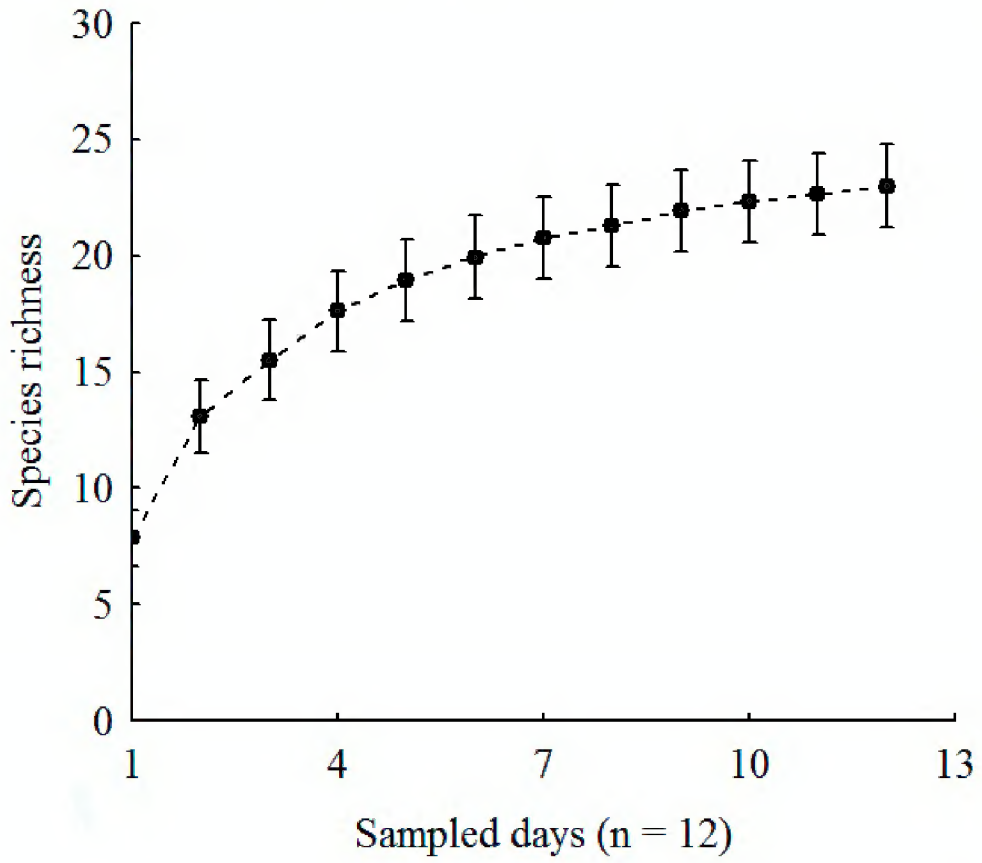

Figure 3. Rarefaction curve indicating the number of species recorded according to the number of sampled days. The dots show the observed species richness and the bars represent the standard deviation.

Notable sightings were of five Collared Peccaries (*Pecari tajacu*), four Capuchin Monkeys (*Sapajus libidinosus*) and three Tapetis (*Sylvilagus brasiliensis*).

Among the recorded species, seven are considered endangered in Brazil (MMA 2014): Giant Anteater (*Myrmecophaga tridactyla*), Giant Armadillo (*Priodontes maximus*), Tapir (*Tapirus terrestris*), Jaguarundi (*Puma yagouaroundi*), Ocelot (*Leopardus pardalis*), Puma (*Puma concolor concolor*) and Maned Wolf (*Chrysocyon brachyurus*). According to the IUCN Red List, the Giant Anteater, the Giant Armadillo and the tapir are classified globally as vulnerable and the Maned Wolf is near threatened (IUCN 2014).

DISCUSSION

The species richness and diversity of mammals recorded at MASP shows the relevance of this protected area for the conservation of the regional fauna, especially of endangered species. Also, the MASP is located in a highly fragmented landscape, where there are no large areas with native vegetation that can safeguard wildlife. The species richness and diversity recorded is high when compared to studies carried out in Cerrado and Atlantic Forest fragments located in the midwest and southeast regions of Brazil. By comparison: Silva (2012) recorded 20 species of medium and large-sized mammals in four Cerrado fragments in the municipality of Ipameri, state of Goiás; Alves et al. (2014) recorded 18 species of mammals in three fragments in Uberlândia, state of Minas Gerais; Estrela et al. (2015) recorded 25 species of mammals in a fragment in the municipality of Urutaí, state of Goiás.

In MASP, 21 species of medium- and large-sized mammals that are distributed throughout both the Atlantic Forest and the Cerrado biomes were recorded. Only two species, the White-eared Opossum (*Didelphis albiventris*) and the Maned Wolf (*Chrysocyon brachyurus*), are found in the Cerrado and were not originally found in the Atlantic Forest (Paglia et al. 2012, Figure 4), although they can occur at transition zones between the Atlantic Forest and Cerrado (Prado et al. 2008, Queirolo et al. 2011). Therefore, the MASP medium and large-sized mammal community is more similar with the Cerrado biome than with the Atlantic forest, and no endemic Atlantic Forest species were registered.

There are many species in the Park, such as Collared Peccaries (*Pecari tajacu*, the Giant Anteater (*M. tridactyla*) and the Capybara (*Hydrochoerus hydrochaeris*), which are a good source of food for larger carnivores like the puma (*Puma concolor concolor*). During the course of this study there were no records of puma attacks on domestic animals from neighboring properties.

No direct evidence of hunting was found within the MASP. However, the lack of records of some poached species, such as the Red Brocket (*Mazama americana*), and the few records of Spotted Pacas (*Cuniculus paca*), reported only in the park headquarters vicinity, may suggest that extensive poaching occurred in the past. The most undisturbed parts of MASP should support the occurrence of such species, but they were not recorded in these locations. Peres (2000) points out that, in Brazilian Amazonia, hunting is a diffuse form of resource extraction that leaves few detectable signs of its occurrence, which makes it difficult to survey.

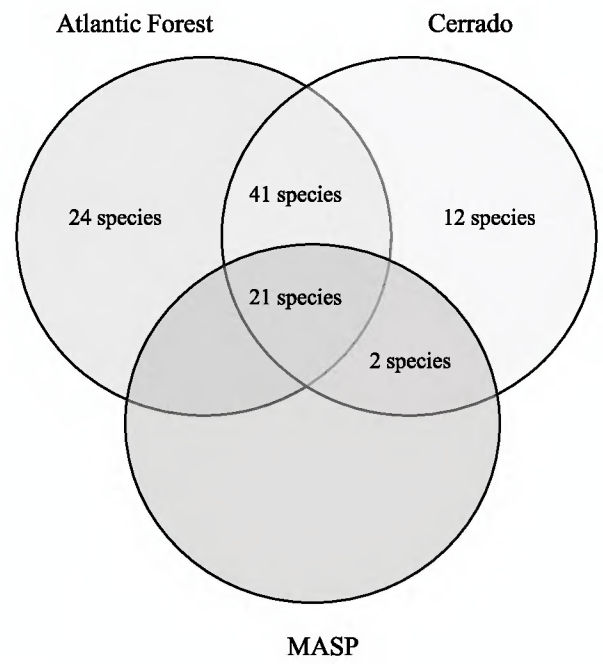

Figure 4. Species of medium- and large-sized mammals occurring in the study area compared with the species from the Atlantic Forest and Cerrado.

This activity may occur extensively in areas where the vegetation structure remains undisturbed, making it relatively difficult to distinguish areas subject to hunting from those where it does not occur.

Tracks of domestic Dogs (*Canis familiaris*) were found in various parts of the MASP, which also represents a concerning issue. These animals, especially when poorly fed, usually hunt alone and can represent a real risk of wildlife predation, besides the possibility of transmitting diseases. Galetti and Sazima (2006) assessed wildlife predation by feral dogs in the Atlantic Forest in southeastern Brazil, and found that mammals were most frequently preyed upon (75%). Even medium and large mammals, such as the Gray Brocket Deer (*Mazama gouazoubira*), the Brown Howler Monkey (*Alouatta guariba*) and the Spotted Paca (*Cuniculus paca*) have been killed by dogs (Galetti and Sazima 2006).

Other concerns regarding the protection of the mammal species are related to the occurrence of fires that can reach large proportions, mainly due to biomass accumulation from old pastures. In addition, wild animals may move out to neighboring properties, which can become a hazard, especially for carnivores, due to potential livestock predation, the reason why they may be hunted and slaughtered.

The results of this study indicate that the MASP plays an important role in the conservation of the regional mammal fauna, to the extent that it shelters considerable species richness of medium and large-sized species. It is recommended to conduct long-term studies in order to monitor the mammals in the area, in addition to calculating estimates and abundance evaluations of the species of greatest interest for conservation.

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LITERATURE CITED

Alvares, C.A., J.L. Stape, P.C. Sentelhas, J.L.M. Gonçalves and G. Sparovek. 2014. Köppen's climate classification map for Brazil. Meteorologische Zeitschrift 22(6): 711–728. doi: 10.1127/0941-2948/2013/0507

Alves, G.B., O. Marçal-Junior and V.L.C. Brites. 2014. Medium and large-sized mammals of a fragment of Cerrado in the Triângulo Mineiro region, Southeastern Brazil. Bioscience Journal 30(3): 863–873.

Chiarello, A.G. 2000. Density and population size of mammals in remnants of Brazilian Atlantic Forest. Conservation Biology 14(6):1649–1657. doi: 10.1111/j.1523-1739.2000.99071.x

Colwell, R.K. 2013. EstimateS: Statistical estimation of species diversity and shared species from samples. Version 9.1. Accessed at http://viceroy.eeb.uconn.edu/EstimateS, 29 July 2013.

EMBRAPA (Empresa Brasileira de Pesquisa Agropecuária.) 2006. Sistema Brasileiro de classificação de solos, 2nd edition. Brasília / Rio de Janeiro: Embrapa Informação Tecnológica e Embrapa Solos. 306 pp.

Estrela, D.C., D.C. Souza, J.M. Souza and A.L.S. Castro. 2015. Medium and large-sized mammals in a Cerrado área of the state of Goiás, Brazil. Check List 11(4): 1690. doi: 10.15560/11.4.1690

Felfili, J.M. 2003. Fragmentos de florestas estacionais do Brasil Central: diagnóstico e proposta de corredores ecológicos; pp. 195–263, in: R.B. Costa (ed.). Fragmentação florestal e alternativas de desenvolvimento rural na Região Centro-Oeste. Campo Grande: Universidade Católica Dom Bosco.

Filho, C.J.M. 2012. Manual técnico da vegetação brasileira, 2nd edition. Rio de Janeiro: IBGE. 271 pp.

Galetti, M. and I. Sazima. 2006. Impacto de cães ferais em um fragmento urbano de Floresta Atlântica no sudeste do Brasil. Natureza & Conservação 4(1): 58–63.

Garay, I. and B.F.S. Dias. 2001. Conservação da biodiversidade em ecossistemas tropicais: avanços conceituais e revisão das novas metodologias de avaliação de monitoramento. Petrópolis: Editora Vozes. 430 pp.

Heltshe, J.F. and N.E. Forrester. 1983. Estimating species diversity using the Jackknife procedure. Biometrics 39(1):1–11. doi: 10.2307/2530802

IUCN (International Union for Conservation of Nature). 2014. IUCN Red List of threatened species. Version 2014.3. Accessed at http://www.iucnredlist.org, 24 March 2015.

Klink, C.A. and R.B. Machado. 2005. A conservação do Cerrado brasileiro. Megadiversidade 1(1): 147–155.

MMA (Ministério do Meio Ambiente). 2014. Lista Nacional Oficial de Espécies da Fauna Ameaçadas de Extinção, Portaria MMA nº 444, de 17 de dezembro de 2014.

Mittermeier, R.A., P.R. Gil, M. Hoffmann, J. Pilgrim, T. Brooks, C.G. Mittermeier, J. Lamoreux and G.A.B. Fonseca (eds.). 2005. Hotspots Revisited: Earth's biologically richest and most endangered terrestrial ecoregions. Mexico City: CEMEX. 390 pp.

Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. Fonseca and J. Kent. 2000. Biodiversity hotspots for conservation priorities. Nature 403(24): 853–858. doi: 10.1038/35002501

Nascimento, F.O. and G.S.T. Garbino. 2013. On the available names for the northern and eastern South American subspecies of *Puma concolor* (Linnaeus, 1771) (Mammalia: Felidae) and their type localities. Zootaxa 3646(2):194–198. doi: 10.11646/zootaxa.3646.2.8

Oliveira-Filho, A.T. and J.A. Ratter. 2002. Vegetation physiognomies and woody flora of the Cerrado biome; pp. 91–120, in: P.S. Oliveira and R.J. Marquis (eds.). The Cerrados of Brazil. New York: Columbia University Press.

Paglia, A.P., G.A.B. Fonseca, A.B. Rylands, G. Herrmann, L.M.S. Aguiar, A.G. Chiarello, Y.L.R. Leite, L.P. Costa, S. Siciliano, M.C.M. Kierulff, S.L. Mendes, V.C. Tavares, R.A. Mittermeier and J.L. Patton. 2012. Lista anotada dos mamíferos do Brasil, 2nd edition, occasional paper 6. Belo Horizonte: Conservation International. 76 pp.

Pardini, R., E.H. Ditt, L. Cullen Junior, C. Bassi and R. Rudran. 2003. Levantamento rápido de mamíferos terrestres de médio e grande porte, pp. 181–201, in: L. Cullen Júnior, R. Rudran and C. Valladares-Padua (eds.). Métodos de estudos em biologia da conservação e manejo da vida silvestre. Curitiba: Editora da Universidade Federal do Paraná.

Peres, C.A. 2000. Effects of subsistence hunting on vertebrate

community structure in Amazonian Forests. Conservation Biology 14(1): 240–253. doi: 10.1046/j.1523-1739.2000.98485.x

Prado, M.R., E.C. Rocha and G.M.L.D. Giúdice. 2008. Mamíferos de médio e grande porte em um fragmento de Mata Atlântica, Minas Gerais, Brasil. Revista Árvore 32(4): 741–749. doi: 10.1590/S0100-67622008000400016

Queirolo, D., J.R. Moreira, L. Soler, L.H. Emmons, F.H.G. Rodrigues, A.A. Pautasso, J.L. Cartes and V. Salvatori. 2011. Historical and current range of the Near Threatened maned wolf *Chrysocyon brachyurus* in South America. Oryx 45(2): 296–303. doi: 10.1017/S0030605310000372

Ratter, J.A., J.F. Ribeiro and S. Bridgewater. 1997. The Brazilian Cerrado Vegetation and Threats to its Biodiversity. Annals of Botany 80(3): 223-230. doi: 10.1006/anbo.1997.0469

Ribeiro, J.F. and B.M.T. Walter. 1998. Fitofisionomias do bioma Cerrado, pp. 89–166, in: S.M. Sano and S.P. Almeida. Cerrado: ambiente e flora. Planaltina: Embrapa.

Ribeiro, M.C., J.P. Metzger, A.C. Martensen, F.J. Ponzoni and M.M. Hirota. 2009. The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservation. Biological Conservation 142(6): 1141–1153. doi: 10.1016/j.biocon.2009.02.021

Rocha, E.C. and E. Silva. 2009. Composição da mastofauna de médio e grande porte na Reserva Indígena "Parabubure", Mato Grosso, Brasil. Revista Árvore 33(3): 451–459. doi: 10.1590/S0100-67622009000300007

Rocha, E.C., E. Silva, R.N. Feio, S.V. Martins and G. Lessa. 2008. Densidade populacional de raposa-do-campo *Lycalopex vetulus* (Carnivora, Canidae) em áreas de pastagem e campo sujo, Campinápolis, Mato Grosso, Brasil. Iheringia, Série Zoologia 98(1): 78–83. doi: 10.1590/S0073-47212008000100011

Santos, A.J. 2003. Estimativas de riqueza em espécies. In métodos de estudos em biologia da conservação e manejo da vida silvestre, pp. 19–41, in: L. Cullen Júnior, R. Rudran and C. Valladares-Padua (eds.). Métodos de estudos em biologia da conservação e manejo da vida silvestre. Curitiba: Editora da Universidade Federal do Paraná.

SEMARH (Secretaria Estadual do Meio Ambiente e dos Recursos Hídricos). 2014. Parque Estadual da Mata Atlântica. Accessed at http://www.semarh.goias.gov.br/site/conteudo/parque-estadual-da-mata-atlantica-pema, 15 October 2014.

Silva, P. M. 2012. Mamíferos silvestres de médio e grande porte em fragmentos do Cerrado no município de Ipameri, sudeste goiano [dissertation (Master's in Geography)]. Catalão: Universidade Federal de Goiás. 99 pp.

Stehmann, J.R., R.C. Forzza, A. Salino, M. Sobral, D. Pinheiro and L.H.Y. Kamino (eds.). 2009. Plantas da Floresta Atlântica. Rio de Janeiro: Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. 516 pp.

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